

Using Total Lightning Observations to Enhance Lightning Safety

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Lightning is often the underrated threat faced by the public when it comes to dangerous weather phenomena. Typically, larger scale events such as floods, hurricanes, and tornadoes receive the vast majority of attention by both the general population and the media. This comes from the fact that these phenomena are large, longer lasting, can impact a large swath of society at one time, and are dangerous events. The threat of lightning is far more isolated on a case by case basis, although millions of cloud-to-ground lightning strikes hit this United States each year. While attention is given to larger meteorological events, lightning is the second leading cause of weather related deaths in the United States.

This information raises the question of what steps can be taken to improve lightning safety. Already, the meteorological community's understanding of lightning has increased over the last 20 years. Lightning safety is now better addressed with the National Weather Service's access to the National Lightning Detection Network data and enhanced wording in their severe weather warnings. Also, local groups and organizations are working to improve public awareness of lightning safety with easy phrases to remember, such as "When Thunder Roars, Go Indoors." The impacts can be seen in the greater array of contingency plans, from airports to sports stadiums, addressing the threat of lightning. Improvements can still be made and newer technologies may offer new tools as we look towards the future.

One of these tools is a network of sensors called a lightning mapping array (LMA). Several of these networks exist across the United States. NASA's Short-term Prediction Research and Transition Center (SPoRT), part of the Marshall Spaceflight Center, has access to three of these networks from Huntsville, Alabama, the Kennedy Space Center, and Washington D.C. The SPoRT program's mission is to help transition unique products and observations into the operational forecast environment. SPoRT has been collaborating with the Huntsville National Weather Service (NWS) Office since 2003 and has since included several other offices to better implement LMA observations into real-time applications. Much of that work has focused on the LMA's ability to detect intra-cloud lightning in addition to cloud-to-ground lightning strikes. Combined, these observations are called total lightning. With total lightning observations, NWS offices can enhance their situational awareness and improve severe weather warnings. Just as importantly, the observed intra-cloud flashes often precede the first cloud-to-ground strike by a few minutes. SPoRT and its partner NWS offices are working to develop visualizations and applications to better utilize these data. However, there is a drawback. The LMAs have a short range of no more than 200 km. This is being addressed with the next generation geostationary satellite, GOES-R, which will boast the Geostationary Lightning Mapper (GLM). SPoRT, in conjunction with NOAA's GOES-R Proving Ground, is working to prepare the end user community for the GLM era using the LMA observations as a demonstration tool. Working collaboratively with our NWS partners, SPoRT is working to determine how best to integrate these future observations to improve both severe storm warnings and lightning safety.